

AMENDMENTS TO THE CLAIMS

Please amend the claims as follows:

Listing of Claims:

Claim 1 (Currently Amended): An image processing method for correcting image distortions caused by oblique imaging in which a tangible object on an object plane is captured from different oblique directions to obtain a plurality of partially overlapping images, comprising the steps of:

determining a feature point of one of the plurality of partially overlapping images corresponding to a common location of the tangible object, shared by the plurality of partially overlapping images, and determining a matched point of one of the other partially overlapping images corresponding to the feature point so that a direction of the tangible object plane is calculated based on the feature point and the matched point, the tangible object plane being defined by a spatial orientation of the tangible object;

selecting one of the plurality of partially overlapping images as a standard image whose image distortions are to be corrected; and

generating a distortion-corrected image on a projection plane by projecting the standard image onto the projection plane based on the direction of the tangible object plane such that image distortions in the standard image are eliminated.

Claim 2 (Original): The image processing method according to claim 1 wherein in said selecting step, one of the plurality of partially overlapping images is automatically selected as the standard based on a ratio of an area of an object region to an entire area of each image.

Claim 3 (Original): The image processing method according to claim 1 wherein in said selecting step, one of the plurality of partially overlapping images is automatically selected as the standard based on a direction of a straight-line pattern contained in each image.

Claim 4 (Original): The image processing method according to claim 1 wherein in said selecting step, one of the plurality of partially overlapping images is automatically selected as the standard based on the feature point and the matched point determined by said determining step.

Claim 5 (Original): The image processing method according to claim 1, wherein in said selecting step, one of the plurality of partially overlapping images is automatically selected as the standard image based on a calculated direction of the object plane for each of the partially overlapping images.

Claim 6 (Currently Amended): An image processing method for correcting image distortions caused by oblique imaging in which a tangible object on an object plane is captured from different oblique directions to obtain a plurality of partially overlapping images, comprising the steps of:

determining a feature point of one of the plurality of partially overlapping images corresponding to a common location of the tangible object, shared by the plurality of partially overlapping images, and determining a matched point of one of the other partially overlapping images corresponding to the feature point of said one of the plurality of partially overlapping images so that a direction of the tangible object plane is calculated based on the

feature point and the matched point, the tangible object plane being defined by a spatial orientation of the tangible object;

selecting one of the plurality of partially overlapping images as a standard image that contains a smallest amount of image distortions among the plurality of partially overlapping images; and

combining the other partially overlapping images, which are projected onto an image surface of the standard image with respect to each of the other partially overlapping images, so that a composite image is generated on the image surface so as to correct image distortions in the standard image.

Claim 7 (Currently Amended): An image processing apparatus for correcting image distortions caused by oblique imaging in which a tangible object on an object plane is captured from different oblique directions to obtain a plurality of partially overlapping images, comprising:

a correspondence detecting unit determining a feature point of one of the plurality of partially overlapping images corresponding to a common location of the tangible object, shared by the plurality of partially overlapping images, and determining a matched point of one of the other partially overlapping images corresponding to the feature point of said one of the plurality of partially overlapping images so that a direction of the tangible object plane is calculated based on the feature point and the matched point, the tangible object plane being defined by a spatial orientation of the tangible object;

a standard image setting unit selecting one of the plurality of partially overlapping images as a standard image that contains a smallest amount of image distortions among the plurality of partially overlapping images; and

an image composition unit combining the other partially overlapping images, which are projected onto an image surface of the standard image with respect to each of the other partially overlapping images, so that a composite image is generated on the image surface so as to correct image distortions in the standard image.

Claim 8 (Original): The image processing apparatus according to claim 7, wherein said standard image setting unit is configured such that a user is required to select the standard image when taking the original image from one of the oblique directions, and wherein said image processing apparatus further comprises a notification unit which notifies the user that the standard image is currently taken.

Claim 9 (Currently Amended): An image processing apparatus for correcting image distortions caused by oblique imaging in which a tangible object on an object plane is captured from different oblique directions to obtain a plurality of partially overlapping images, comprising:

a correspondence detecting unit determining a feature point of one of the plurality of partially overlapping images corresponding to a common location of the tangible object, shared by the plurality of partially overlapping images, and determining a matched point of one of the other partially overlapping images corresponding to the feature point so that a direction of the tangible object plane is calculated based on the feature point and the matched point, the tangible object plane being defined by a spatial orientation of the tangible object;

a standard image setting unit selecting one of the plurality of partially overlapping images as a standard image whose image distortions are to be corrected; and

a distortion correcting unit generating a distortion-corrected image on a projection plane by projecting the standard image onto the projection plane based on the direction of the tangible object plane such that image distortions in the standard image are eliminated.

Claim 10 (Previously Presented): The image processing apparatus according to claim 9, further comprising a plurality of imaging units which respectively input the plurality of partially overlapping images that are generated by taking the tangible object from the oblique directions.

Claim 11 (Original): The image processing apparatus according to claim 9, wherein said standard image setting unit is configured such that one of the plurality of partially overlapping images is automatically selected as the standard based on a ratio of an area of an object region to an entire area of each image.

Claim 12 (Original): The image processing apparatus according to claim 9, wherein said standard image setting unit is configured such that one of the plurality of partially overlapping images is automatically selected as the standard based on a direction of a straight-line pattern contained in each image.

Claim 13 (Original): The image processing apparatus according to claim 9, wherein said standard image setting unit is configured such that one of the plurality of partially overlapping images is automatically selected as the standard based on the feature point and the matched point determined by said correspondence detecting unit.

Claim 14 (Original): The image processing apparatus according to claim 9, wherein said standard image setting unit is configured such that one of the plurality of partially overlapping images is automatically selected as the standard image based on a calculated direction of the object plane for each of the partially overlapping images.

Claim 15 (Currently Amended): A computer-readable storage medium storing program code instructions for causing a computer to execute an image distortion correction processing to correct image distortions caused by oblique imaging in which a tangible object on an object plane is taken from different oblique directions to obtain a plurality of partially overlapping images, comprising:

first program code means for causing the computer to determine a feature point of one of the plurality of partially overlapping images corresponding to a common location of the tangible object, shared by the plurality of partially overlapping images, and to determine a matched point of one of the other partially overlapping images corresponding to the feature point so that a direction of the tangible object plane is calculated based on the feature point and the matched point, the tangible object plane being defined by a spatial orientation of the tangible object;

second program code means for causing the computer to select one of the plurality of partially overlapping images as a standard image whose image distortions are to be corrected; and

third program code means for causing the computer to generate a distortion-corrected image on a projection plane by projecting the standard image onto the projection plane based on the direction of the tangible object plane such that image distortions in the standard image are eliminated.

Claim 16 (Currently Amended): A computer-readable storage medium storing program code instructions for causing a computer to execute an image distortion correction processing to correct image distortions caused by oblique imaging in which a tangible object on an object plane is captured from different oblique directions to obtain a plurality of partially overlapping images, comprising:

first program code means for causing the computer to determine a feature point of one of the plurality of partially overlapping images corresponding to a common location of the tangible object, shared by the plurality of partially overlapping images, and to determine a matched point of one of the other partially overlapping images corresponding to the feature point of said one of the plurality of partially overlapping images so that a direction of the tangible object plane is calculated based on the feature point and the matched point, the tangible object plane being defined by a spatial orientation of the tangible object;

second program code means for causing the computer to select one of the plurality of partially overlapping images as a standard image that contains a smallest amount of image distortions among the plurality of partially overlapping images; and

third program code means for causing the computer to combine the other partially overlapping images, which are projected onto an image surface of the standard image with respect to each of the other partially overlapping images, so that a composite image is generated on the image surface so as to correct image distortions in the standard image.

Claim 17 (Previously Presented): The image processing method of Claim 1, wherein said standard image is projected with a perspective projection matrix operation.

Claim 18 (Previously Presented): The image processing method of Claim 6, wherein said other partially overlapping images are projected with a perspective projection matrix operation.

Claim 19 (Previously Presented): The image processing apparatus of Claim 7, wherein said other partially overlapping images are projected with a perspective projection matrix operation.

Claim 20 (Previously Presented): The image processing apparatus of Claim 9, wherein said standard image is projected with a perspective projection matrix operation.

Claim 21 (Previously Presented): The computer readable storage medium of Claim 15, wherein said distortion-corrected image is generated with a perspective projection matrix operation.

Claim 22 (Previously Presented): The computer readable storage medium of Claim 16, wherein said other partially overlapping images are projected with a perspective projection matrix operation.

Claim 23 (Previously Presented): The image processing method of Claim 17, wherein said perspective projection matrix is calculated based on coordinates of at least four combinations of feature points of the standard image and matched points corresponding thereto.

Claim 24 (Previously Presented): The image processing method of Claim 18, wherein a least-square-method is used to find parameters of said perspective projection matrix.

Claim 25 (New): The image processing method according to Claim 1, wherein the tangible object is an image on a planar object plane.

Claim 26 (New): The image processing method according to Claim 1, wherein in said selecting, one of the plurality of partially overlapping images is automatically selected as the standard based on a smallest inclination angle of a viewing direction of the oblique imaging.